Enceladus, Curiouser and Curiouser: Observations by *Cassini's* Imaging Science Subsystem

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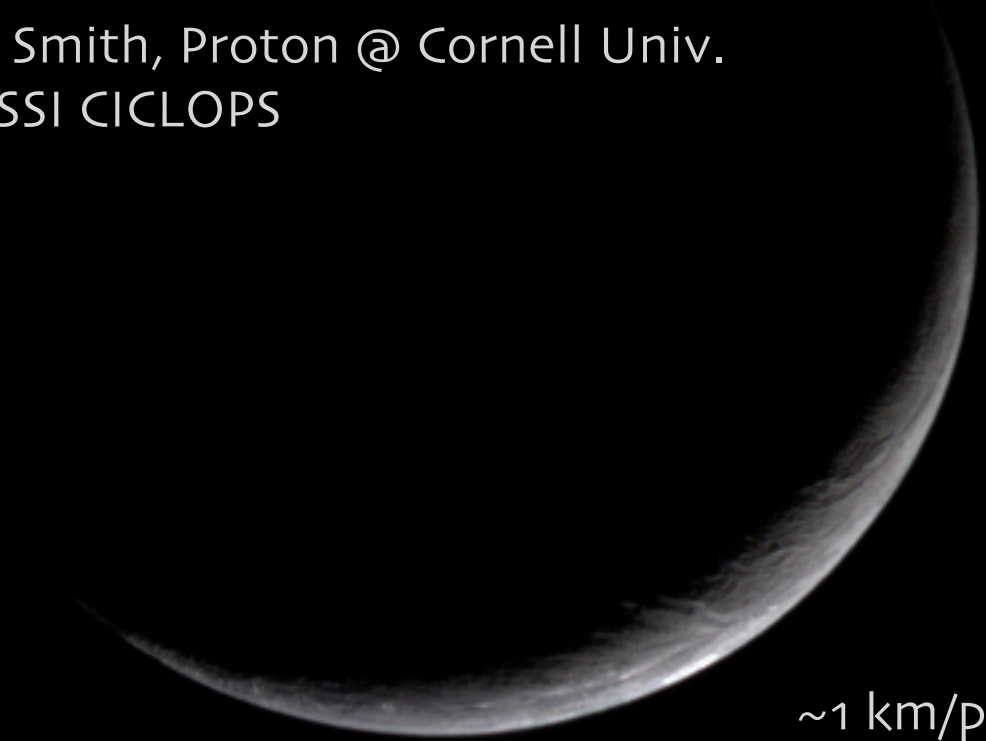


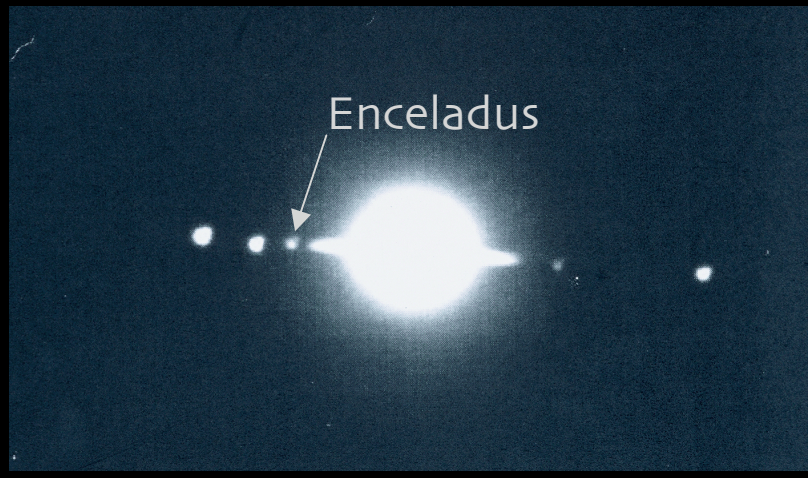
~1 km/pixel

16 January 2005

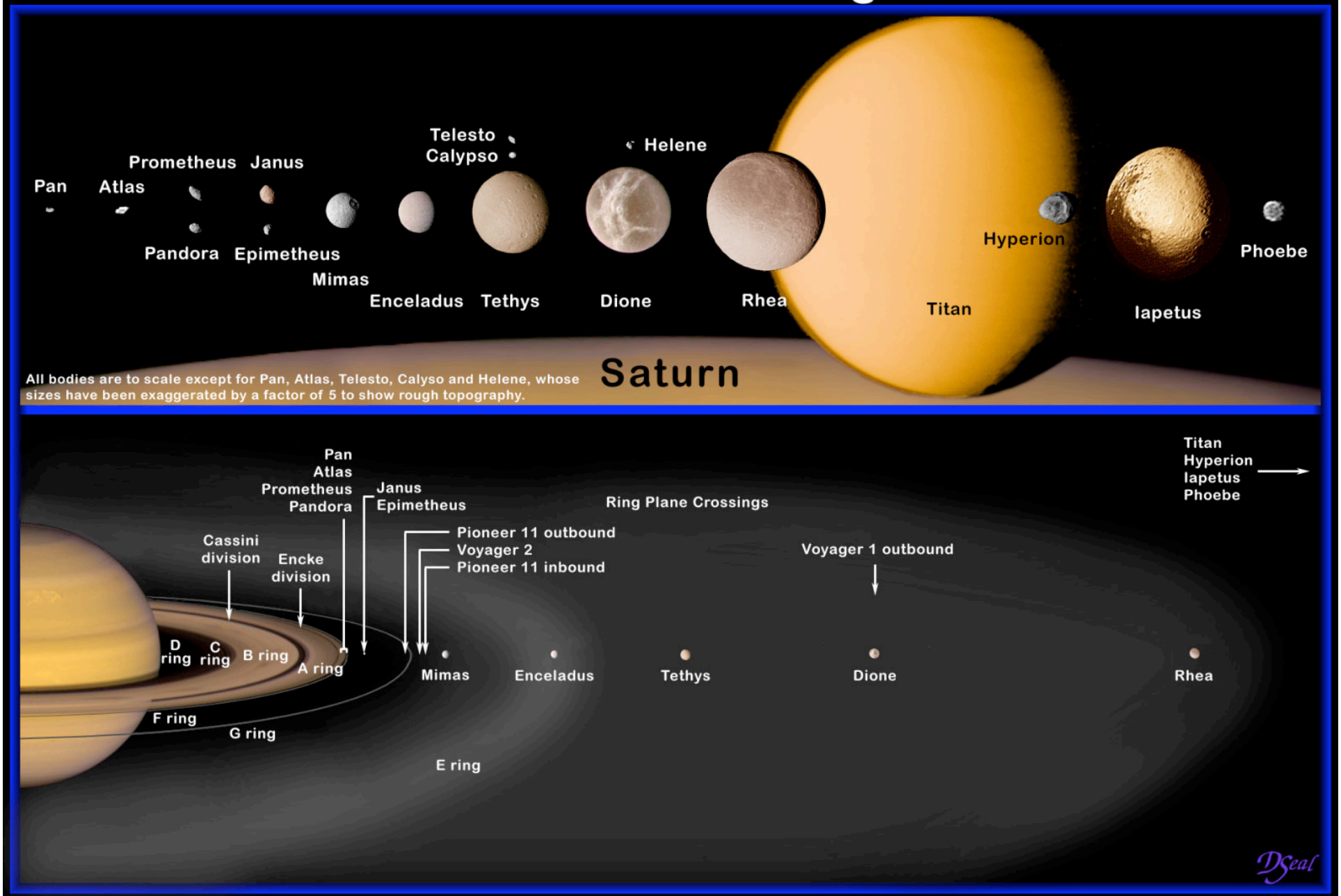
Properties of Enceladus

Discovered	1789 by William Herschel
Distance from Saturn	238×10^3 km = 62% Earth-Moon
Period	32.8 hours = 1.37 days
Radius	~250 km = 7% R_{Moon}
Mass	1.2×10^{20} kg = 0.2% M_{Moon}
Density	1.6 g/cm^3 ; $density_{Moon}$ = 3.3 g/cm^3
Geometric albedo	~1.0 = highest in the Solar System!
Surface composition	Water ice

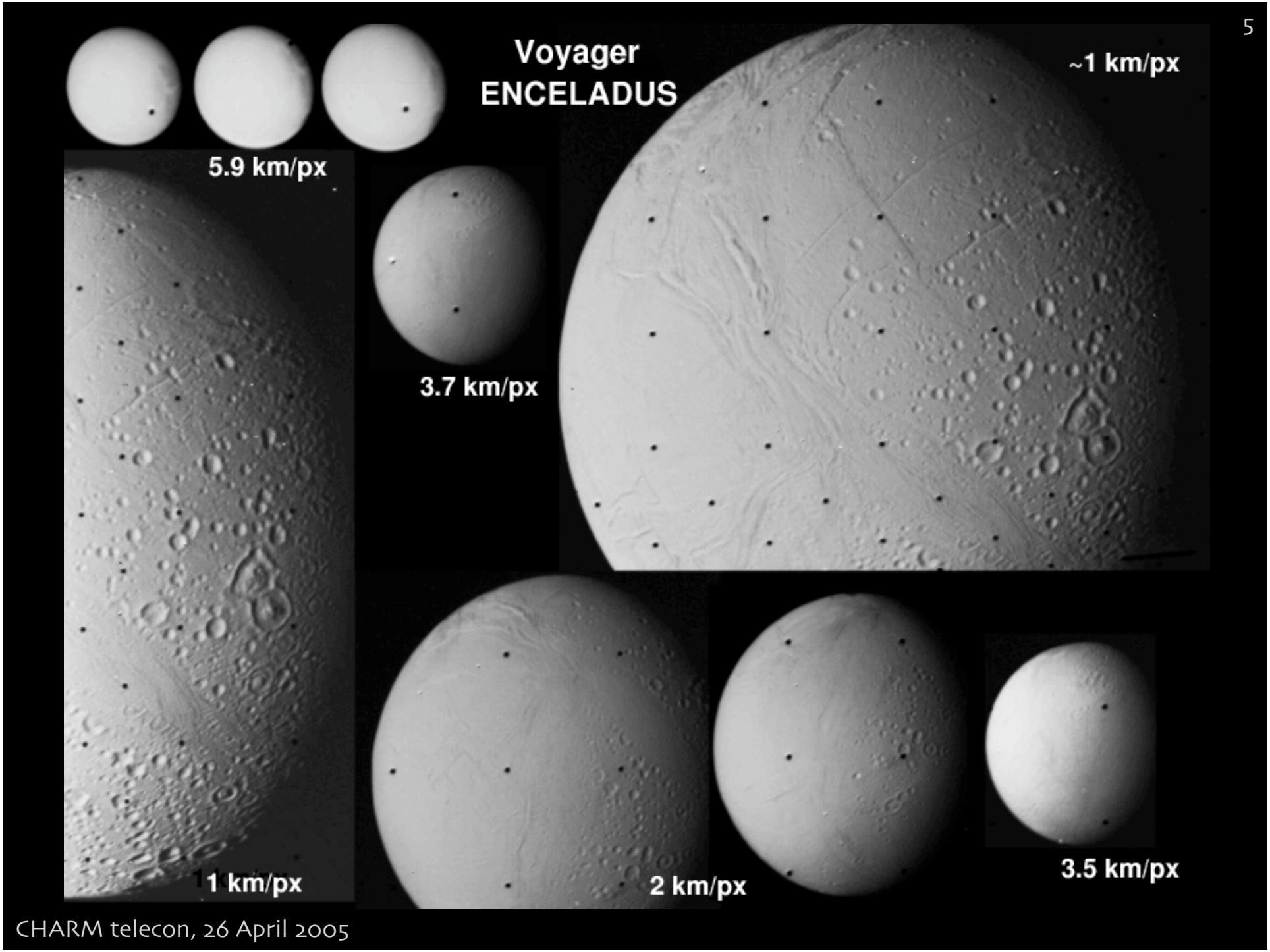
Saturn and its five innermost, medium-sized satellites as seen by the Palomar 60-inch telecsope during the 1997 ring-plane crossing



Saturn's Satellites and Ring Structure



Outer Planet Satellites


Voyager
ENCELADUS
5.9 km/px
3.7 km/px
~1 km/px
1 km/px
2 km/px
3.5 km/px

Cassini's Objectives at Enceladus

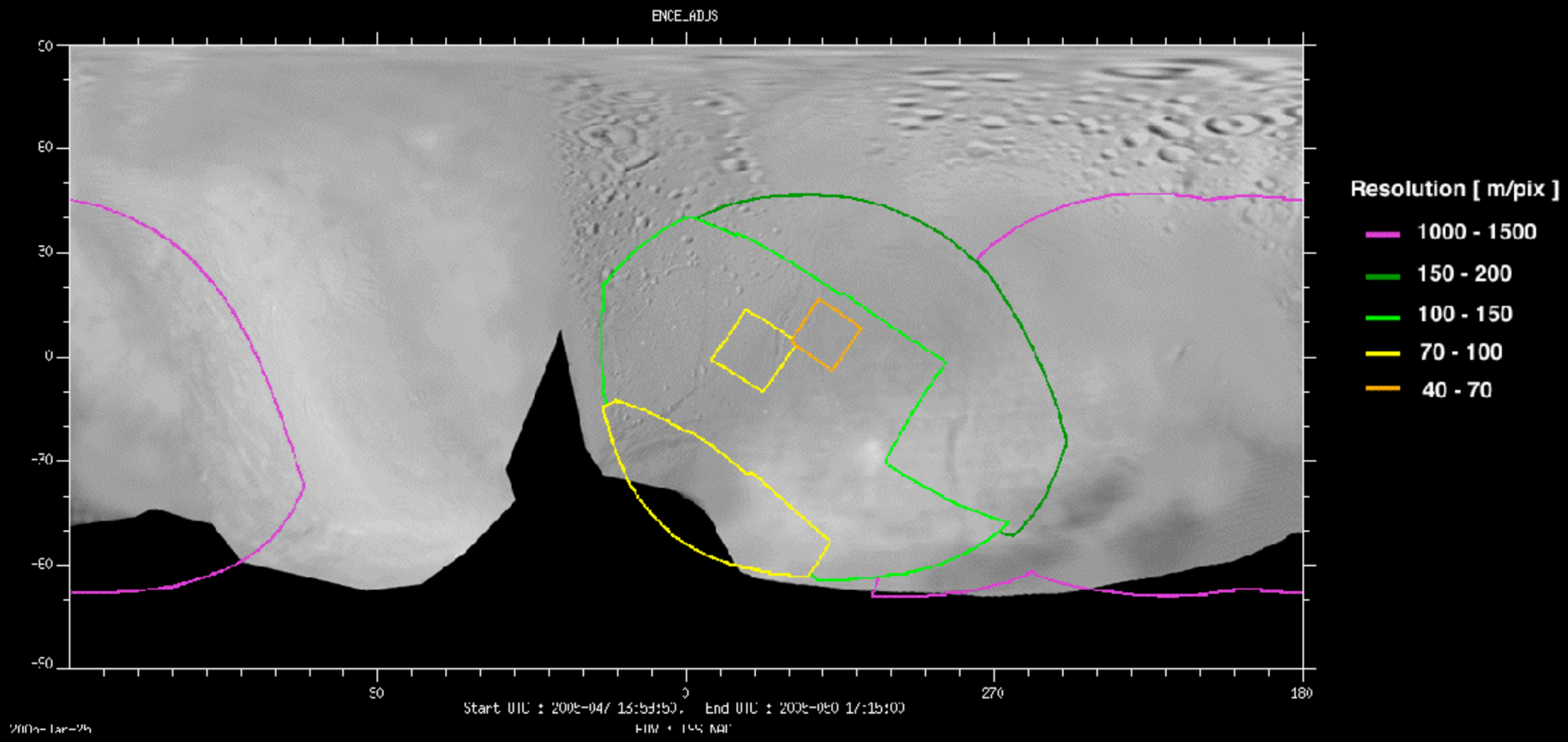
- Determine its characteristics and geological history
- Define the different physical processes that created the surface of Enceladus
- Investigate the composition and distribution of surface materials
- Determine its bulk composition and internal structure
- Investigate the interaction of Enceladus with Saturn's magnetosphere and ring system

Cassini Enceladus Encounters

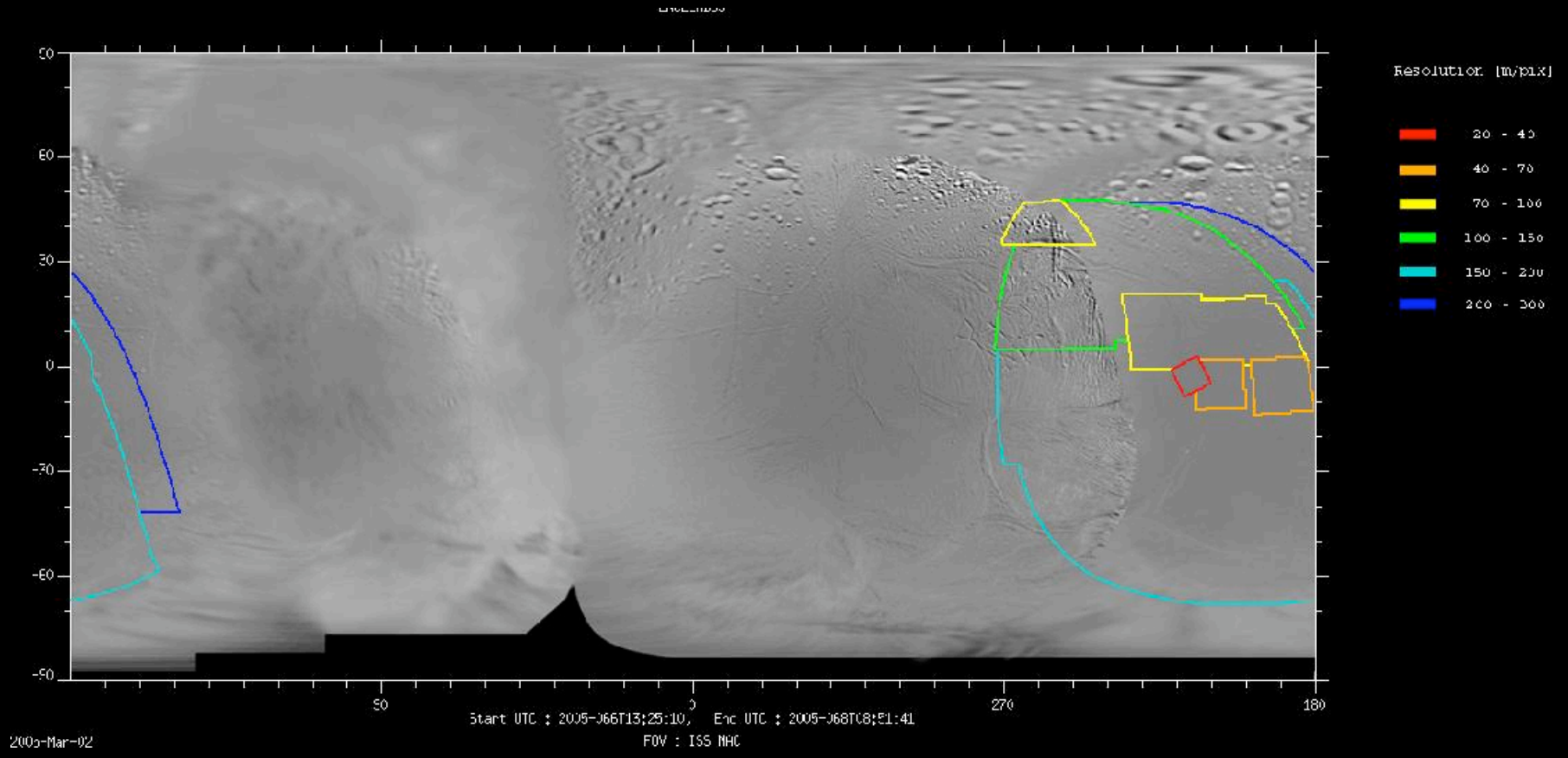
Rev	Date	Distance (km)
003	17 February 2005	1,200
004	9 March 2005	500
005	29 March 2005	64,000
008	21 May 2005	93,000
011	14 July 2005	1,000
028	8 September 2006	40,000
032	9 November 2006	94,000
047	28 June 2007	90,000
050	30 September 2007	88,000
061	12 March 2008	100
074	30 June 2008	99,000

Closest *Voyager* flyby = 90,000 km

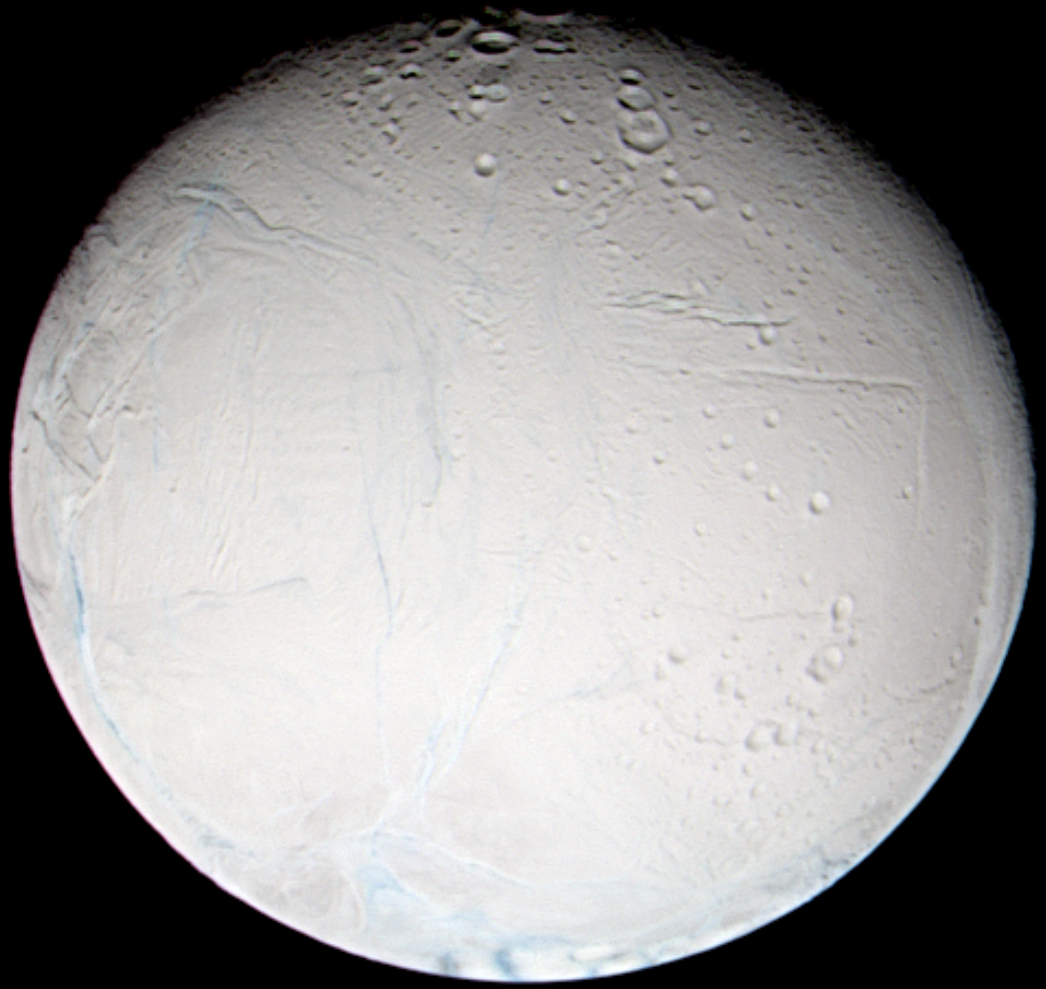
17 February Coverage



9 March Coverage

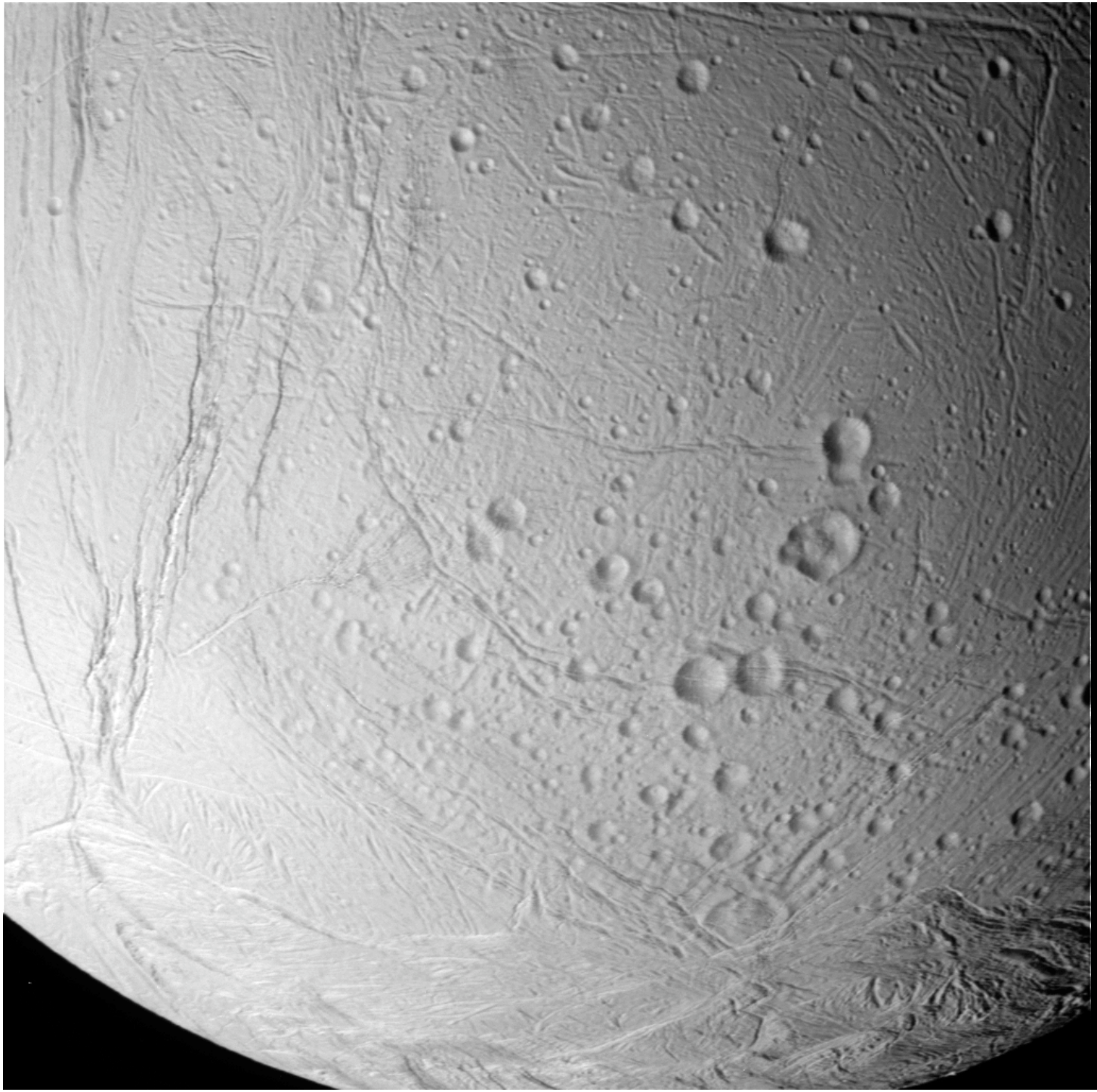


Enceladus in false color



~1 km/pixel

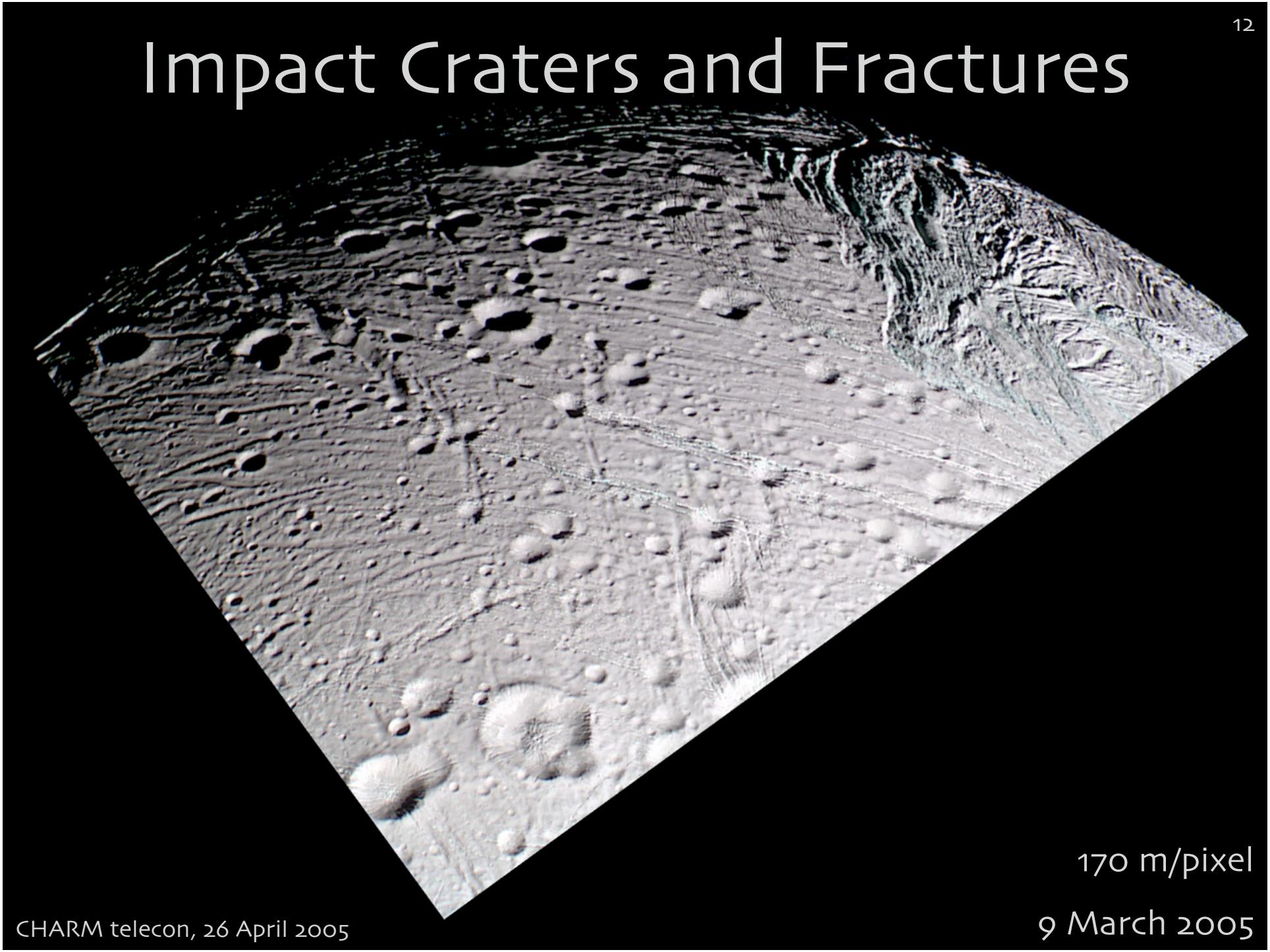
16 February 2005



~300 m/pixel

9 March 2005

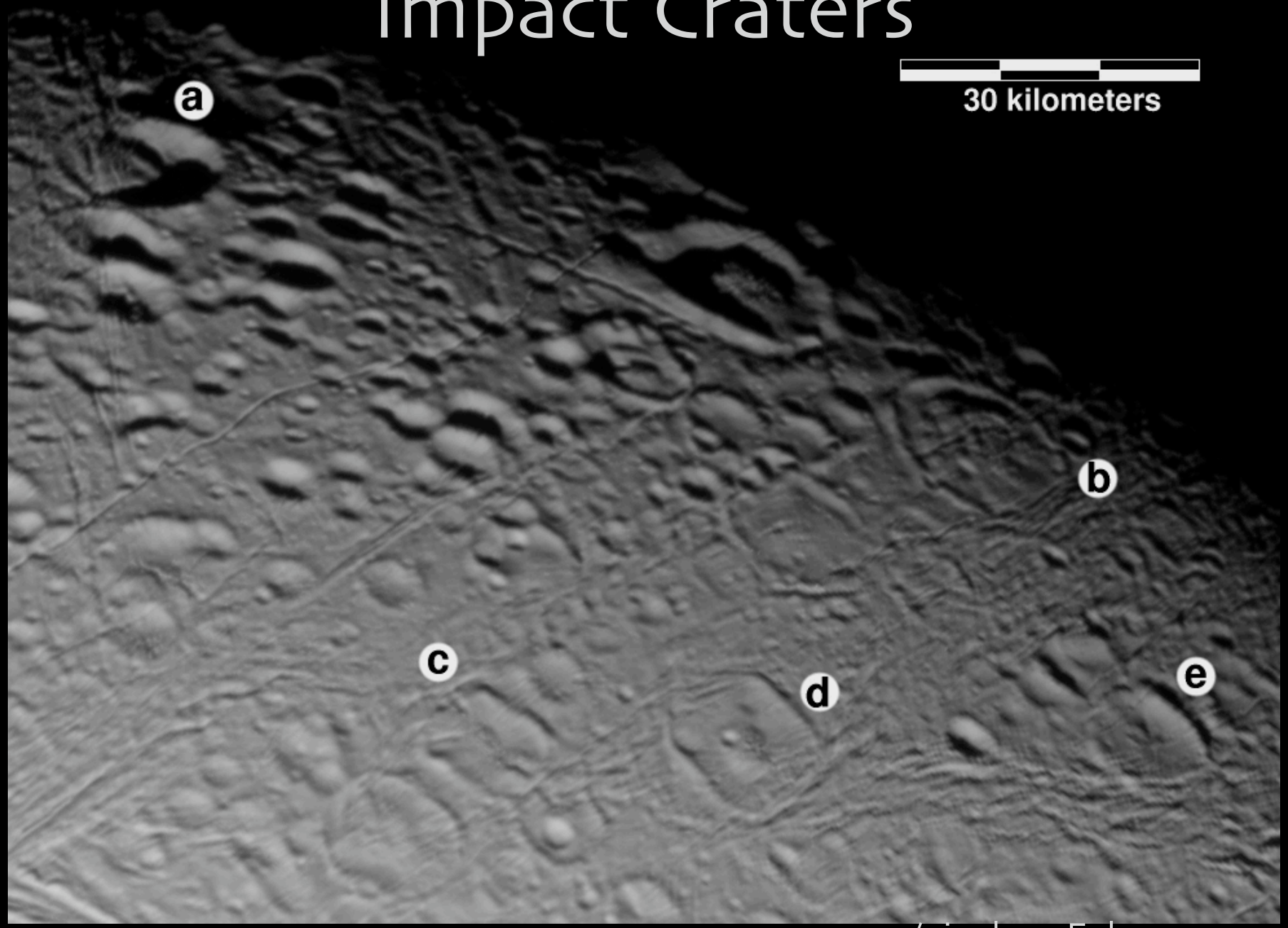
Impact Craters and Fractures



170 m/pixel

9 March 2005

Impact Craters

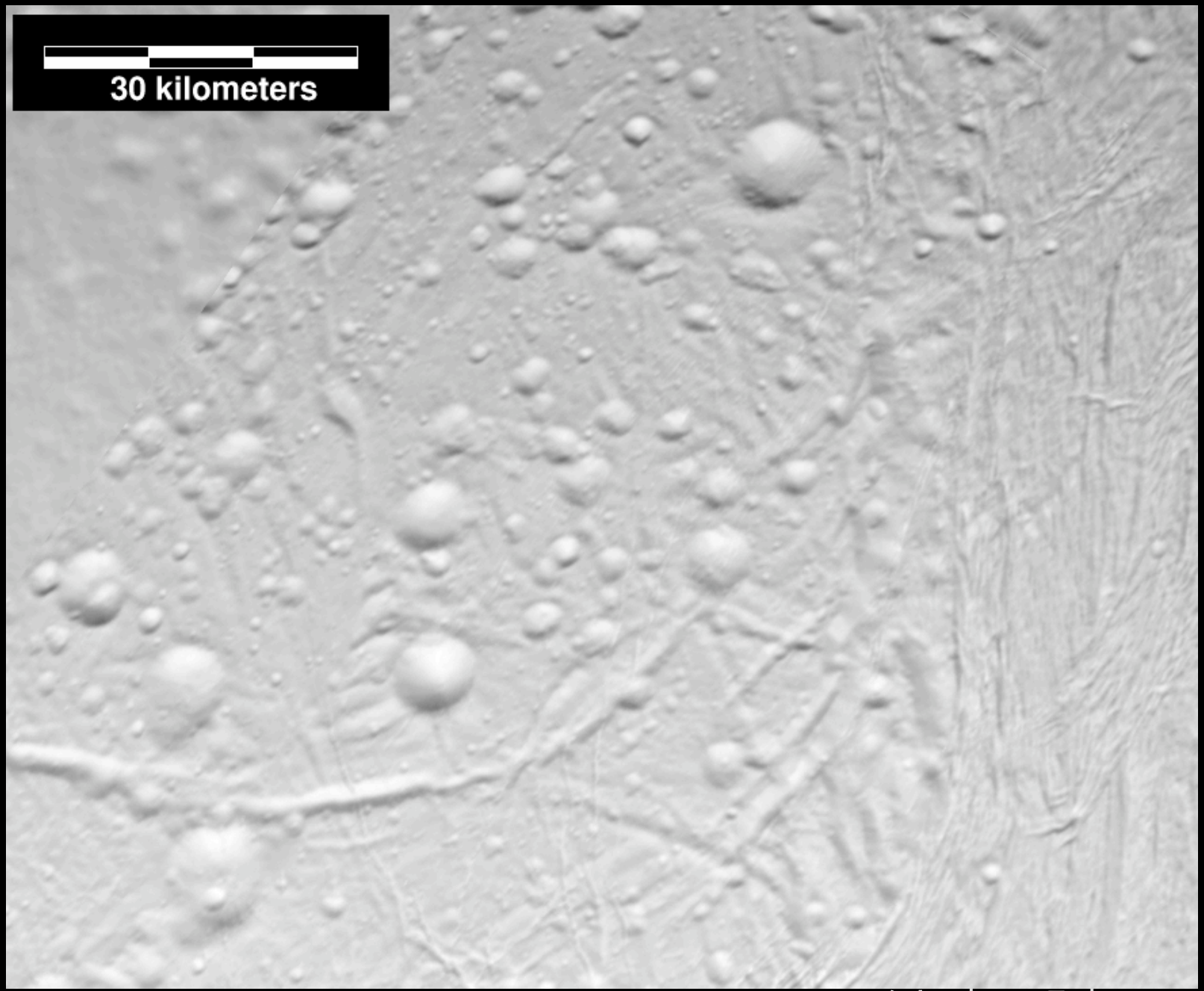


170 m/pixel; 17 February 2005

Impact Craters

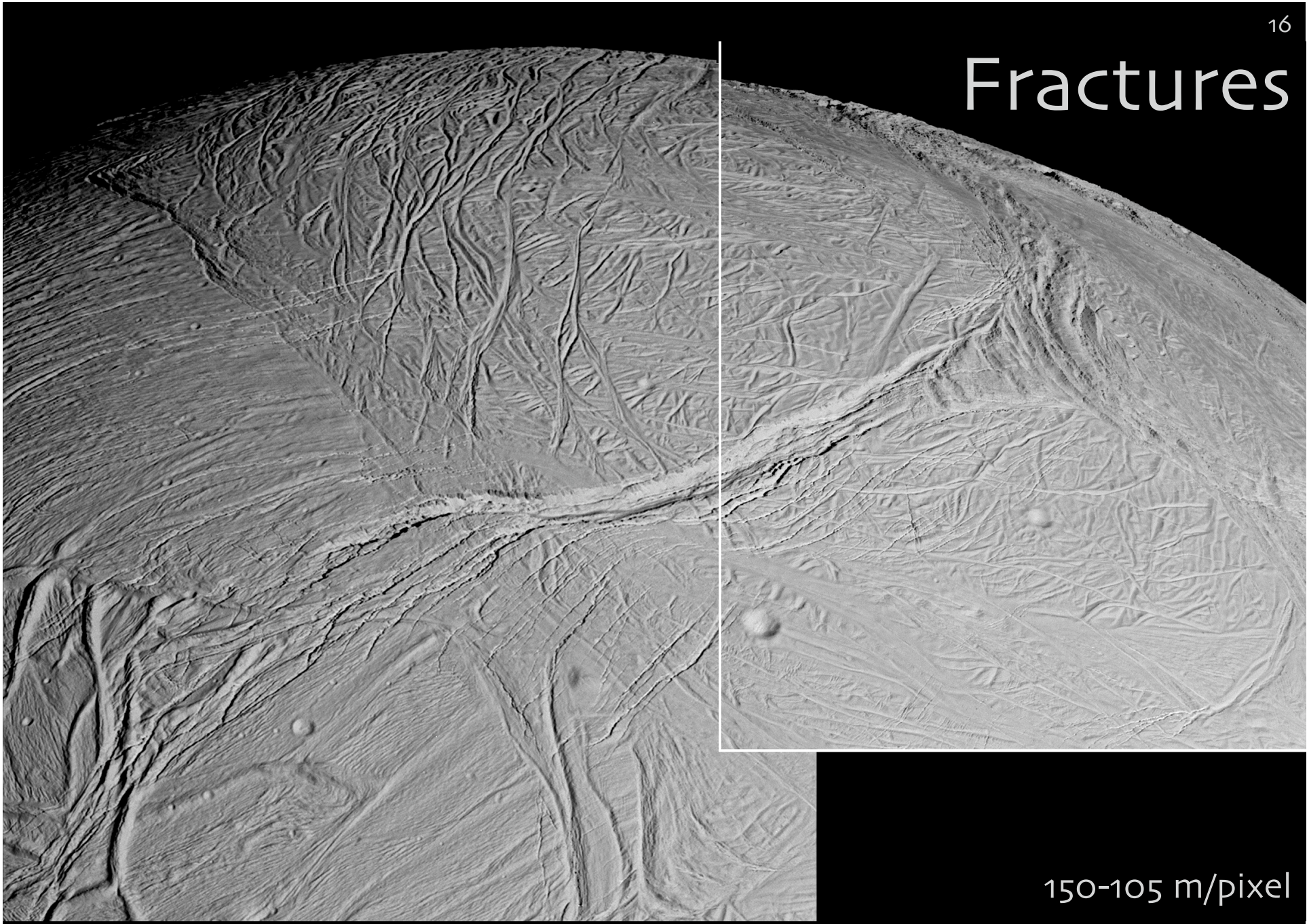
100 m/pixel

9 March 2005



130 m/pixel; 17 February 2005

Fractures

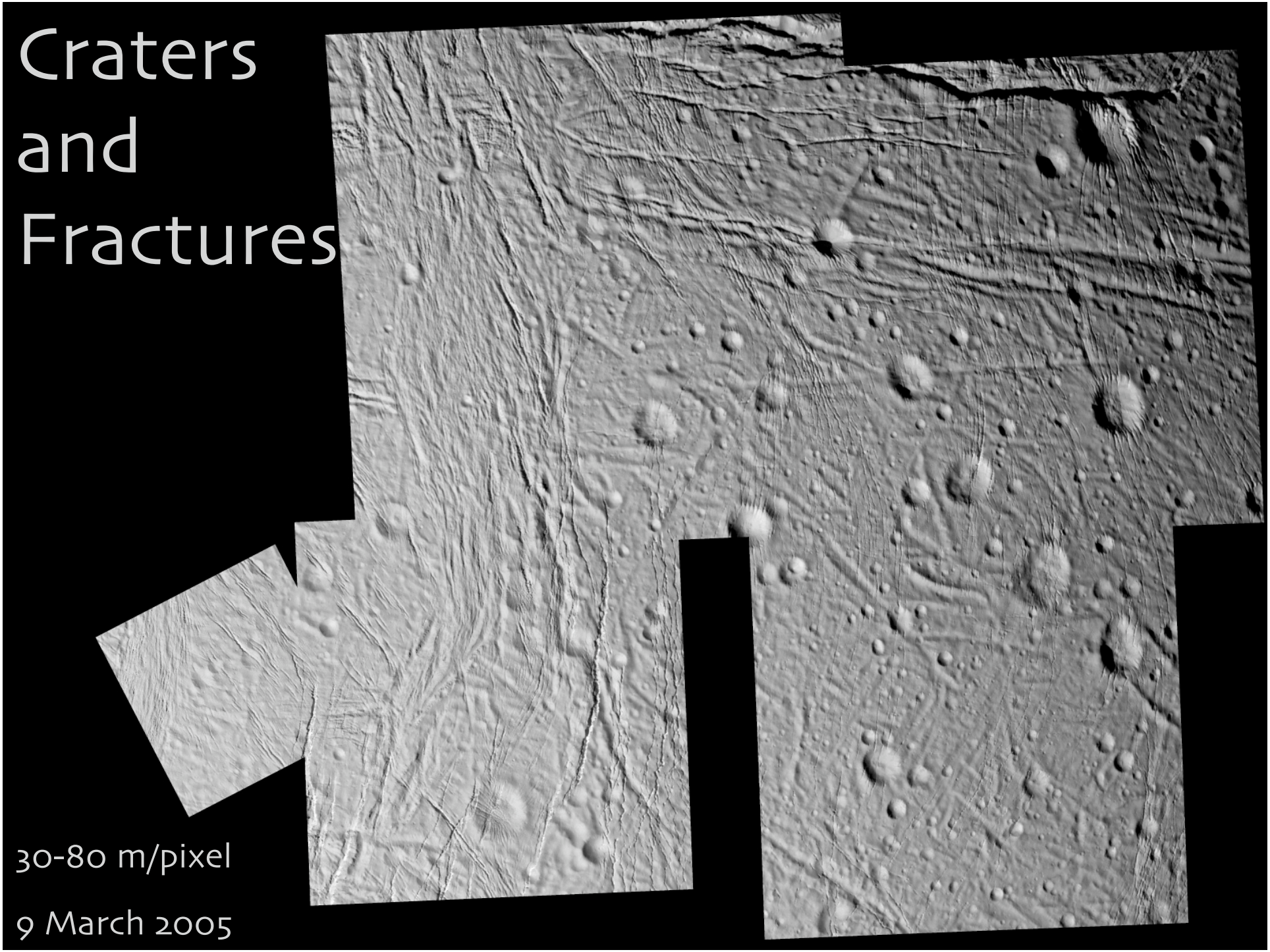


150-105 m/pixel

17 February 2005

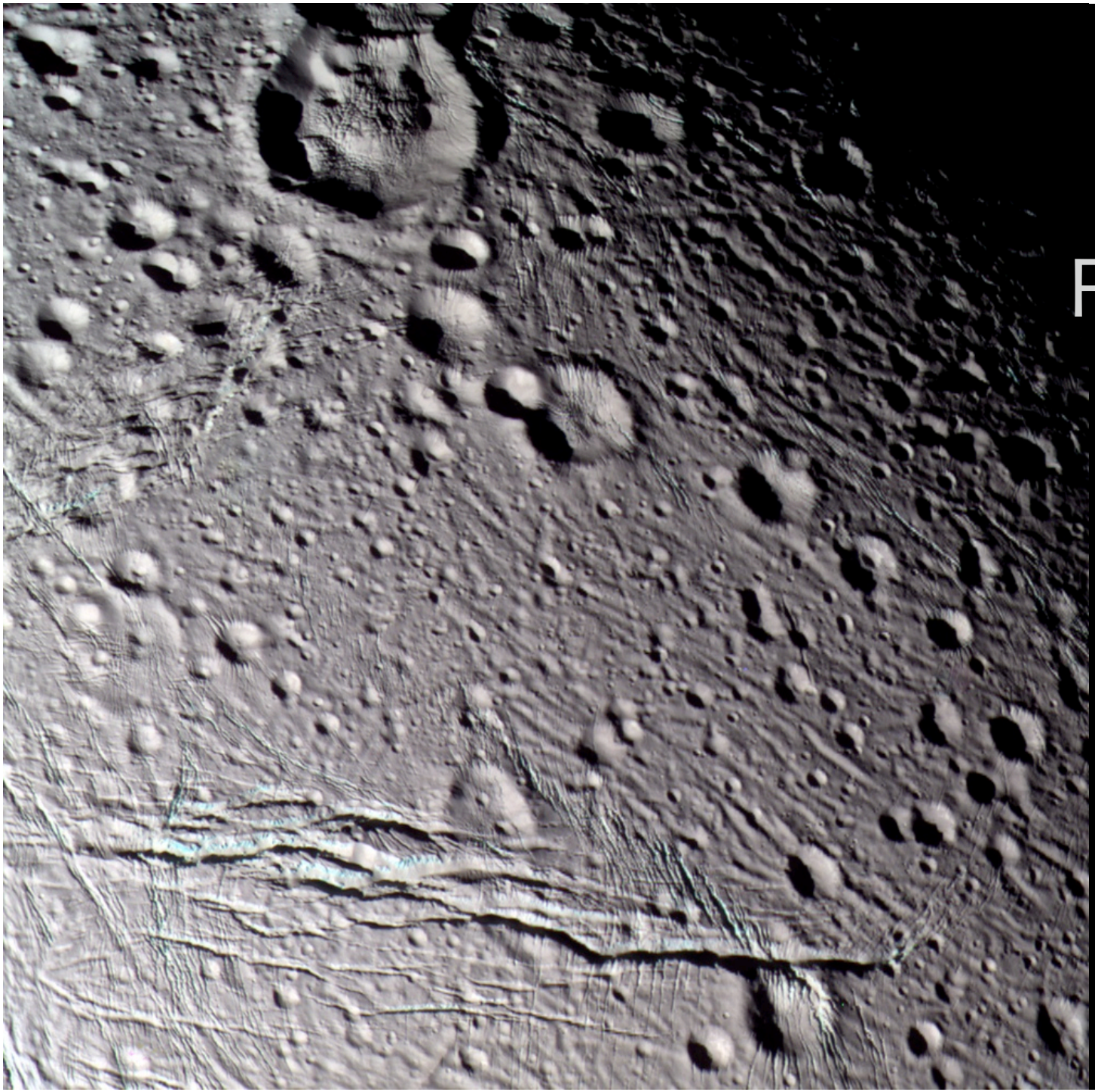
110 m/pixel; 17 February 2005

Craters and Fractures



30-80 m/pixel

9 March 2005



Craters and Fractures in False Color

130 m/pixel

9 March 2005

Fractures[20]

150 m/pixel

9 March 2005

Fractures

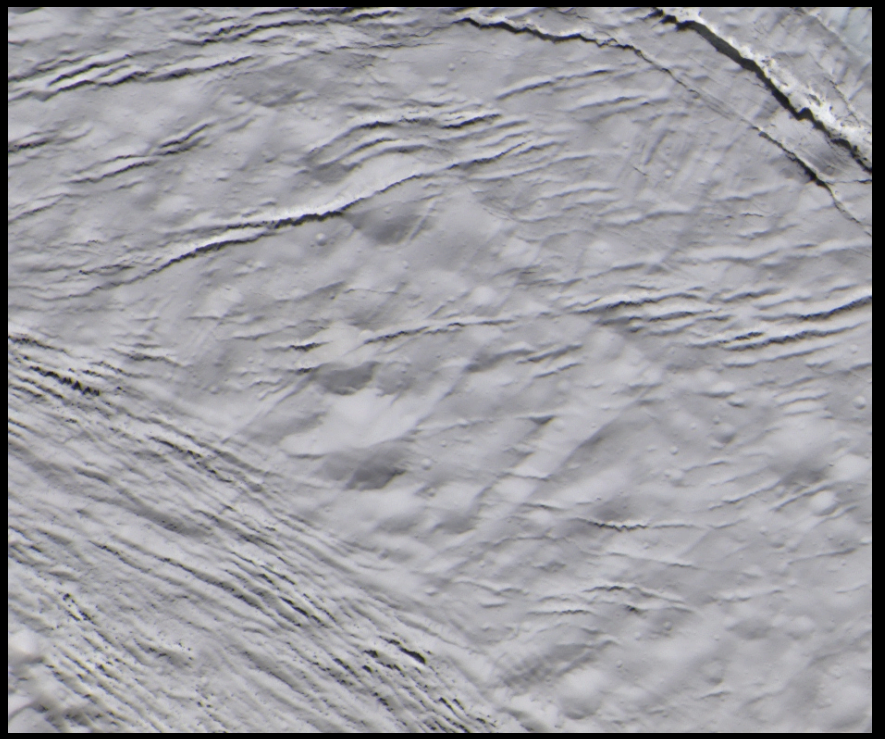
30 m/pixel

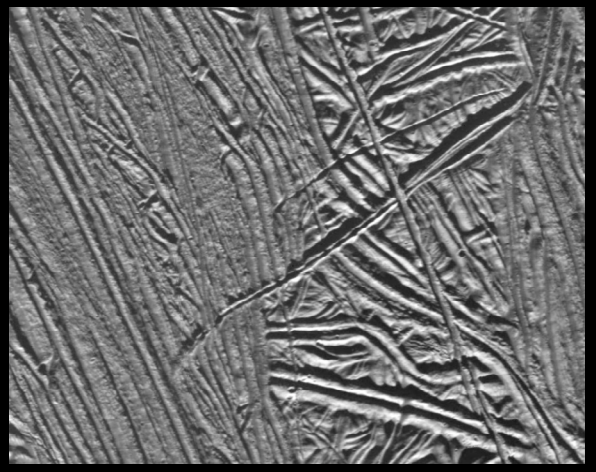
9 March 2005

Icy Satellite Comparison

Galileo Ganymede

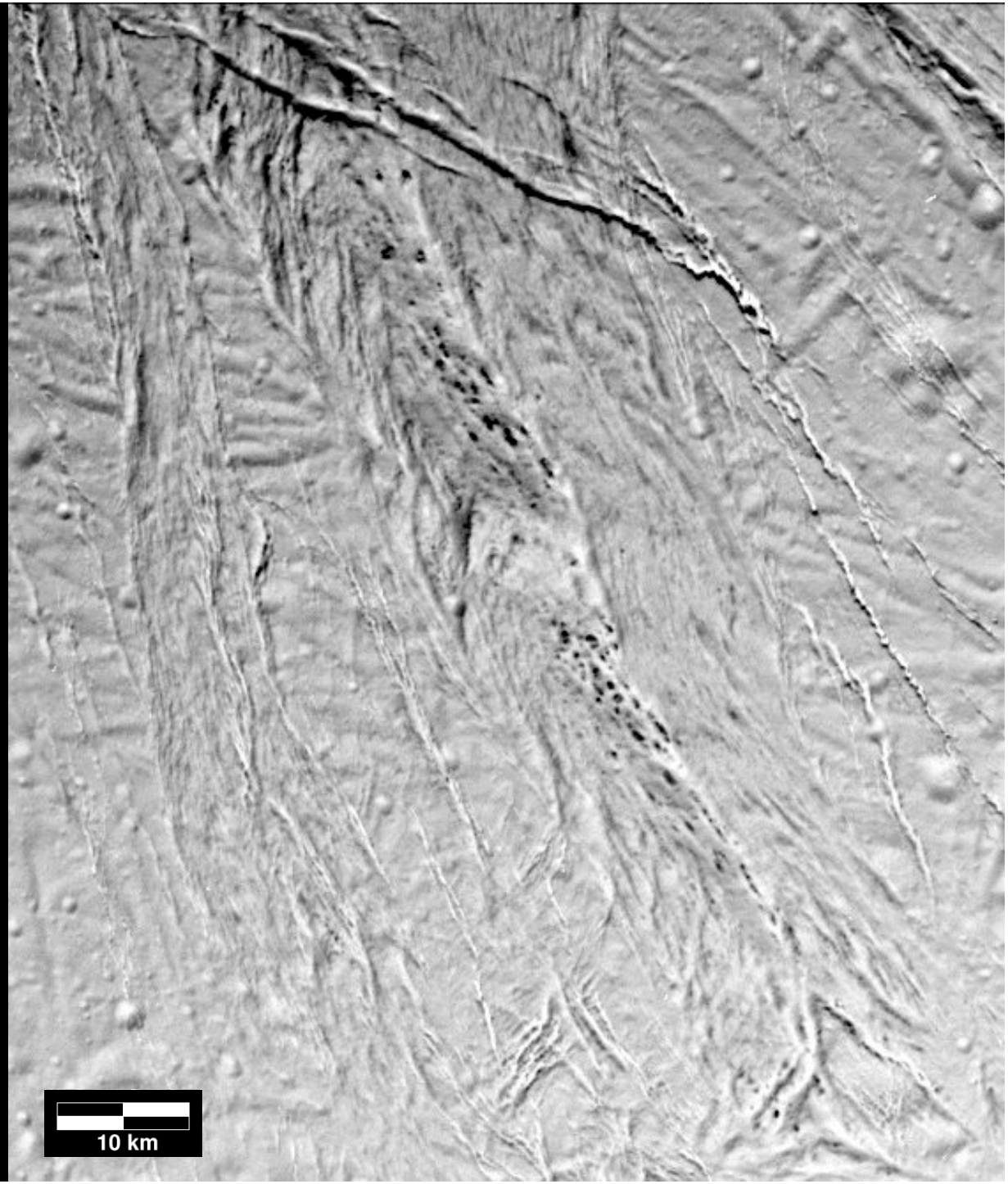
Cassini Enceladus





Galileo Europa

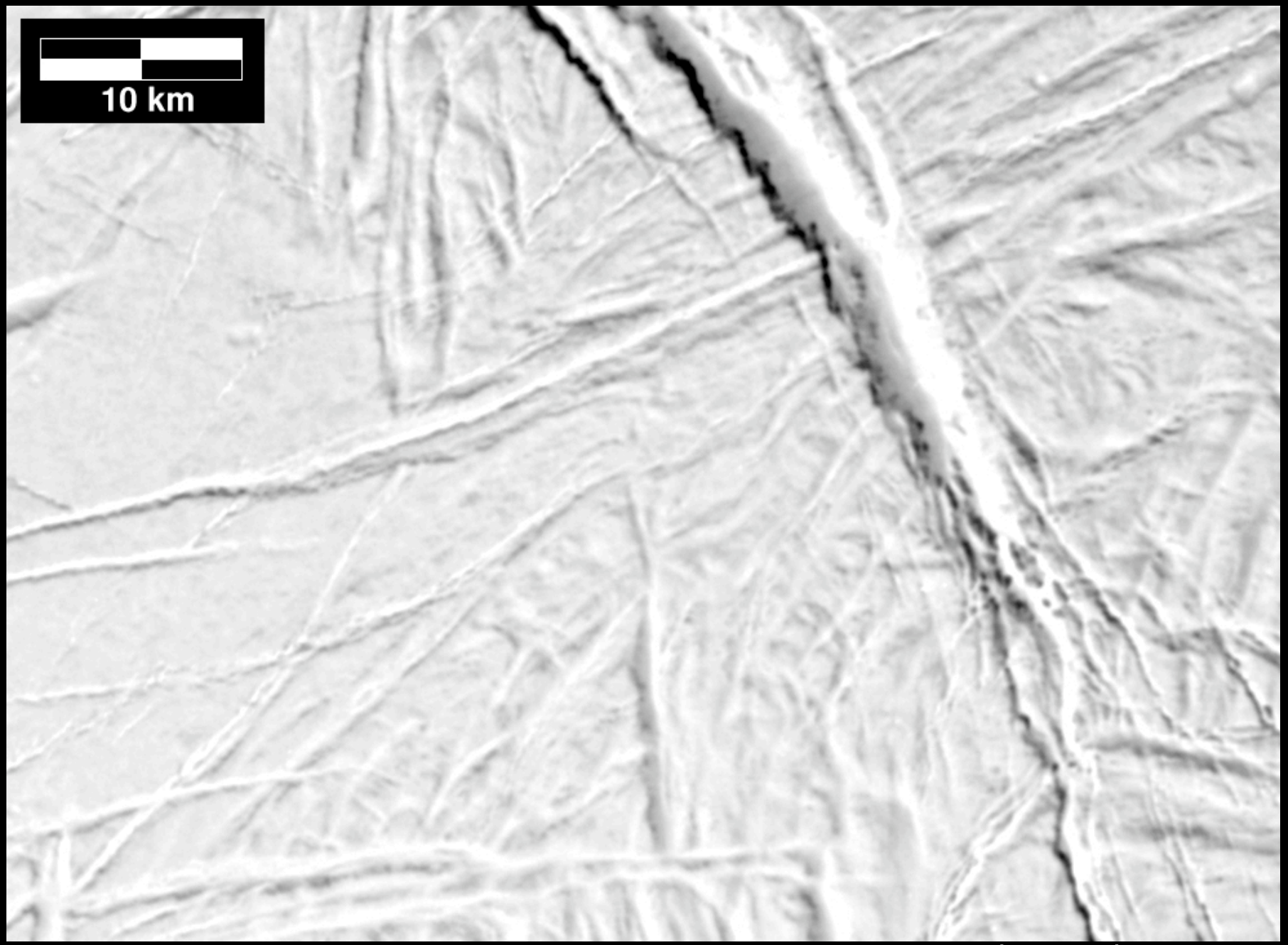
Enceladus Fractures



125 m/pixel

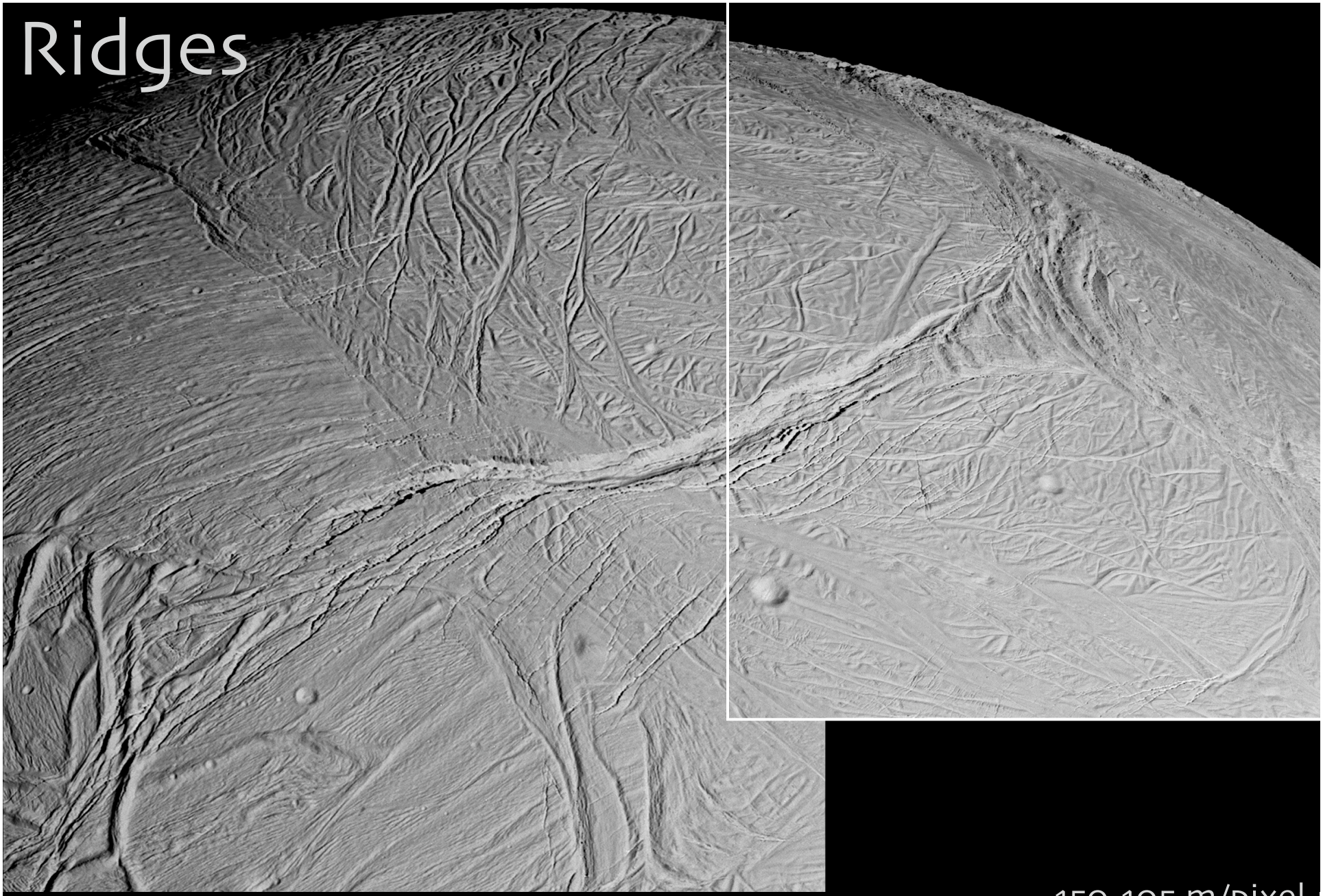
17 February 2005

CHARM telecon, 26 April 2005



110 m/pixel; 17 February 2005

Ridges

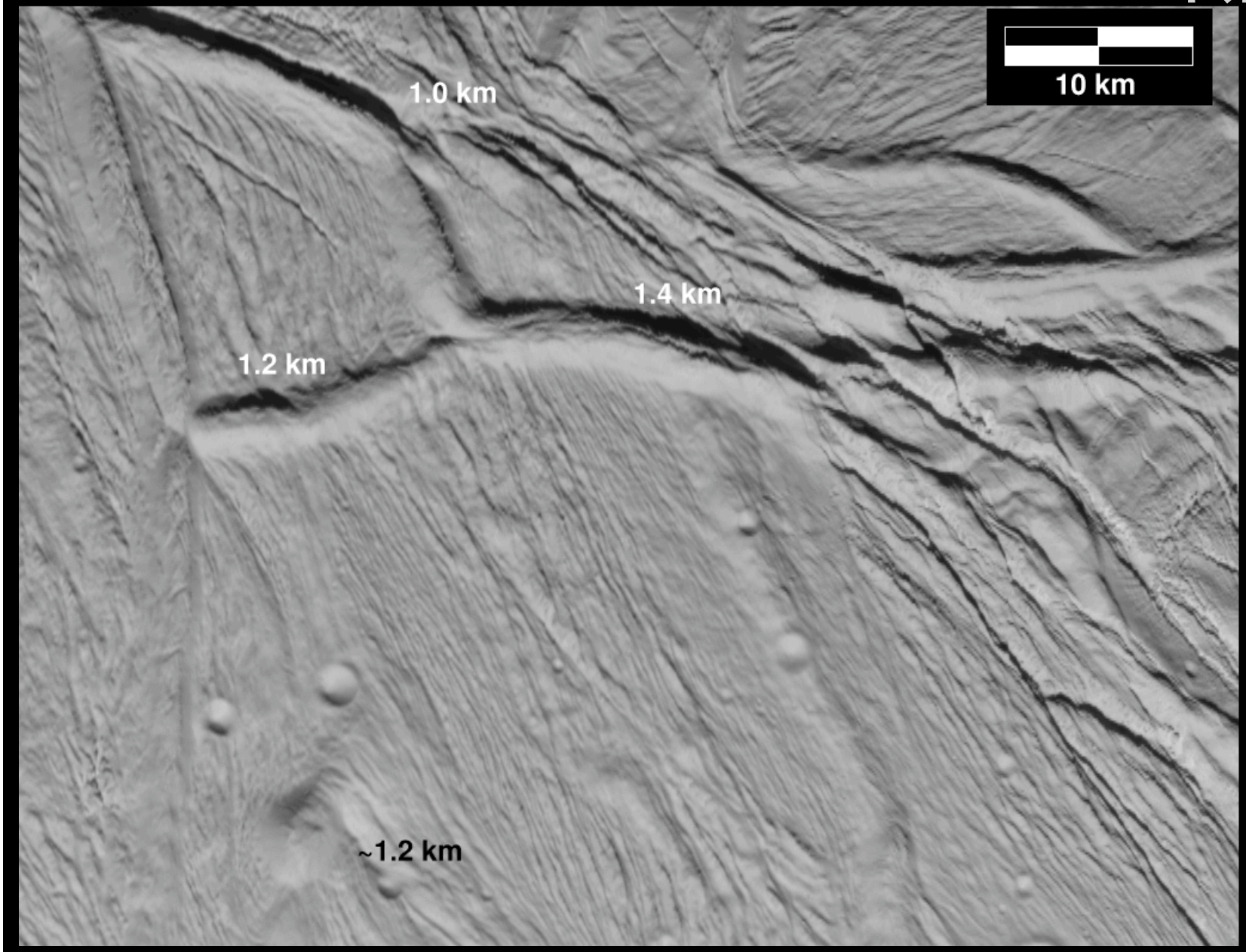


150-105 m/pixel

17 February 2005

CHARM telecon, 26 April 2005

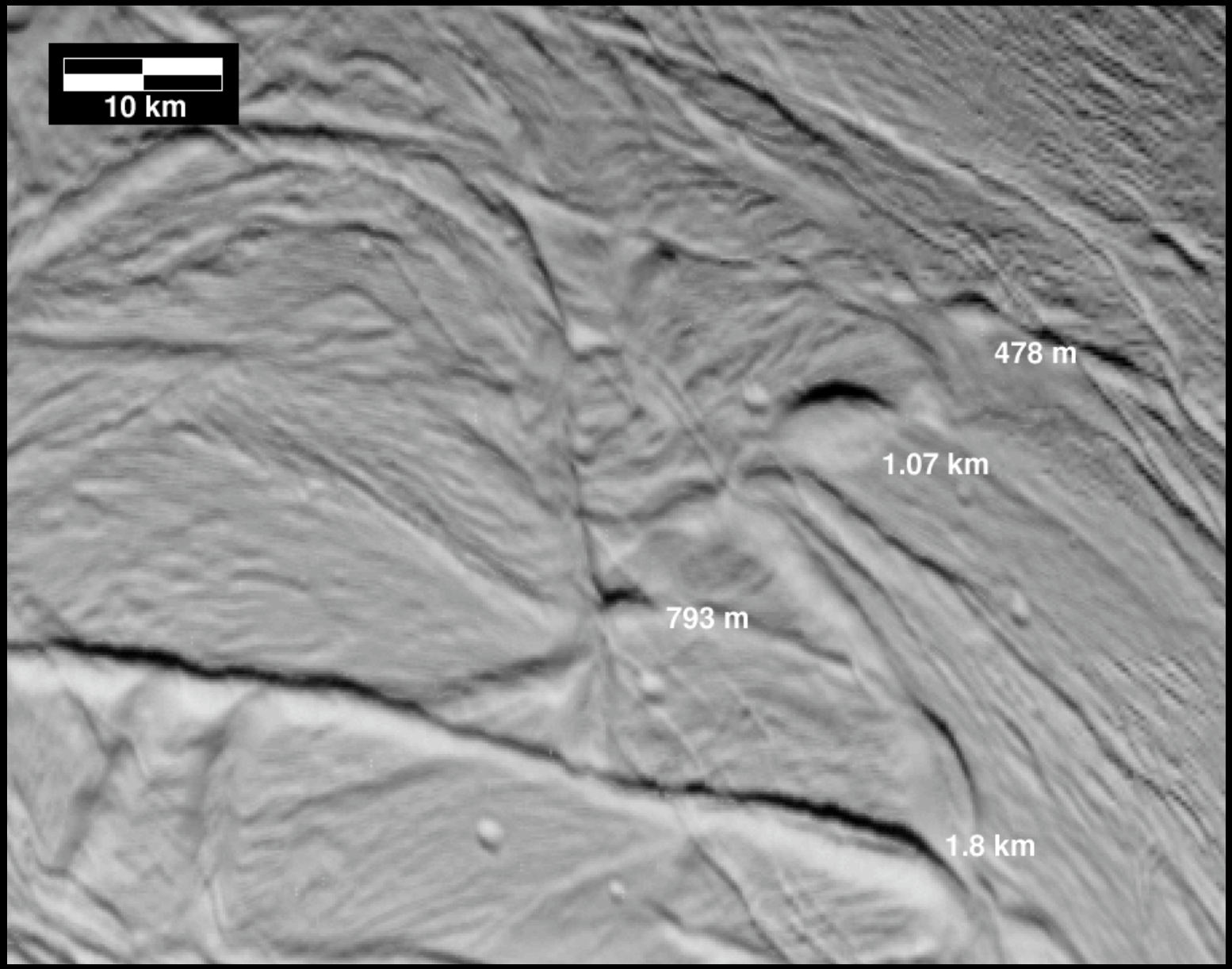
Ridges



60 m/pixel

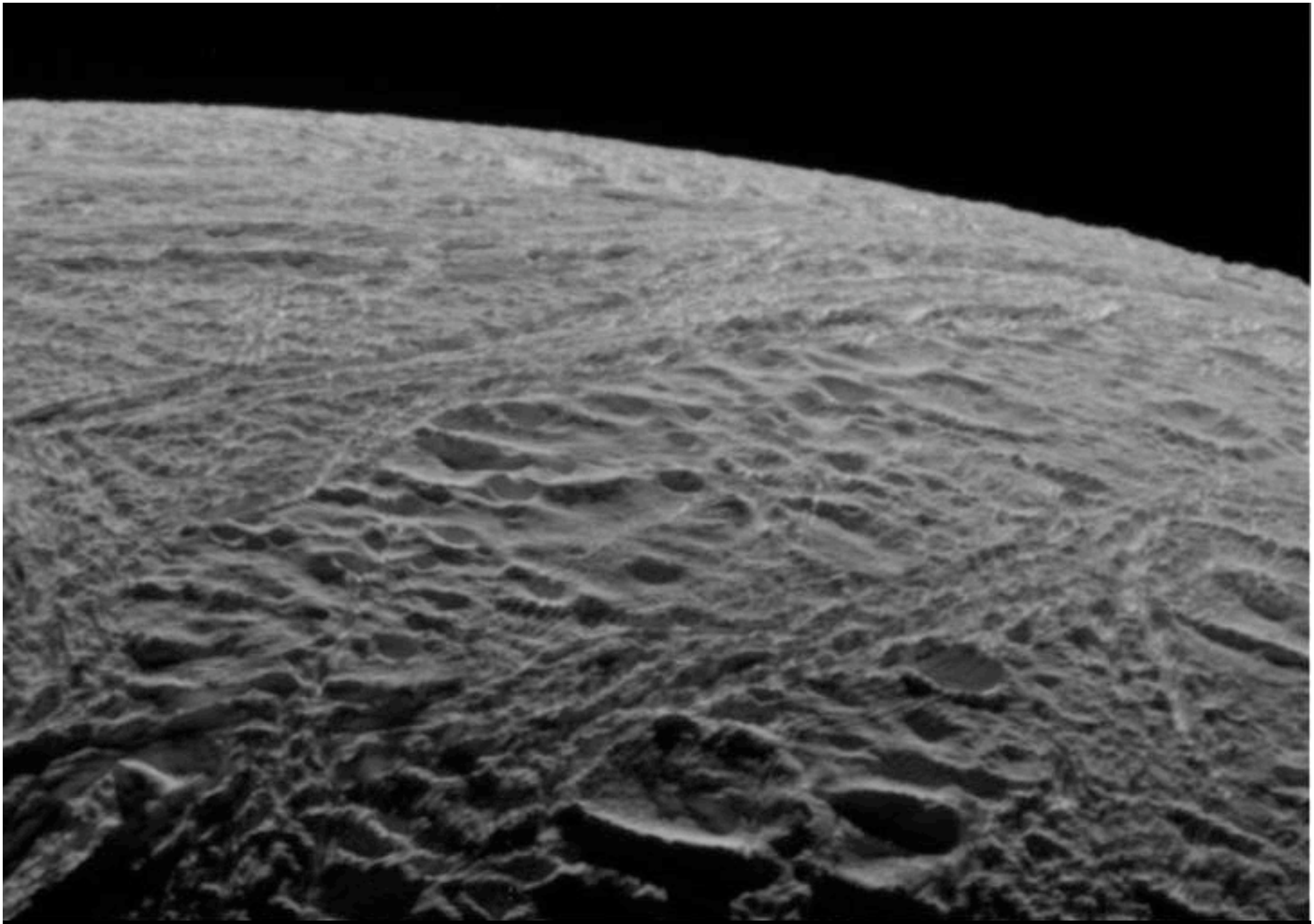
17 February 2005

Domes



170 m/pixel

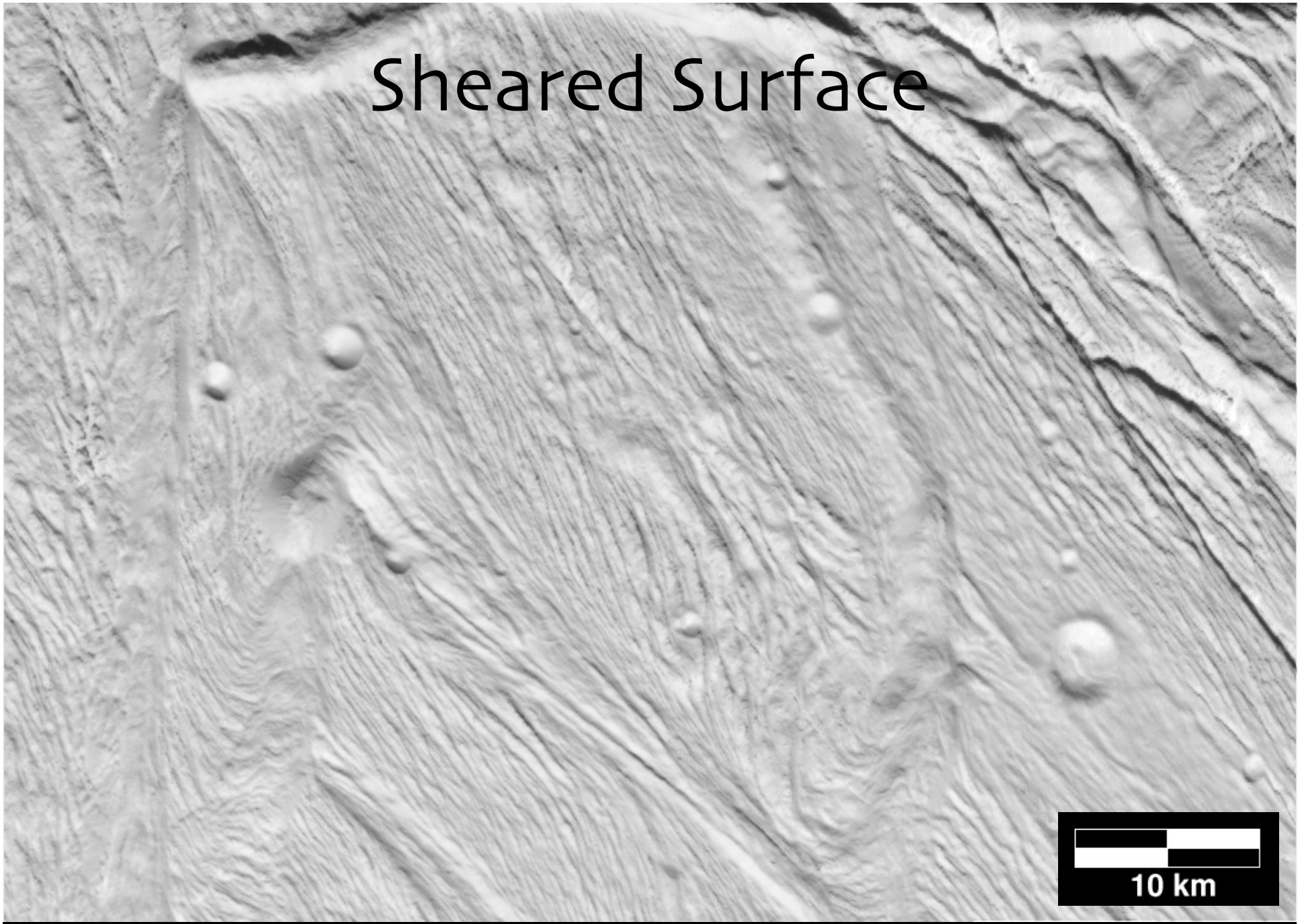
17 February 2005



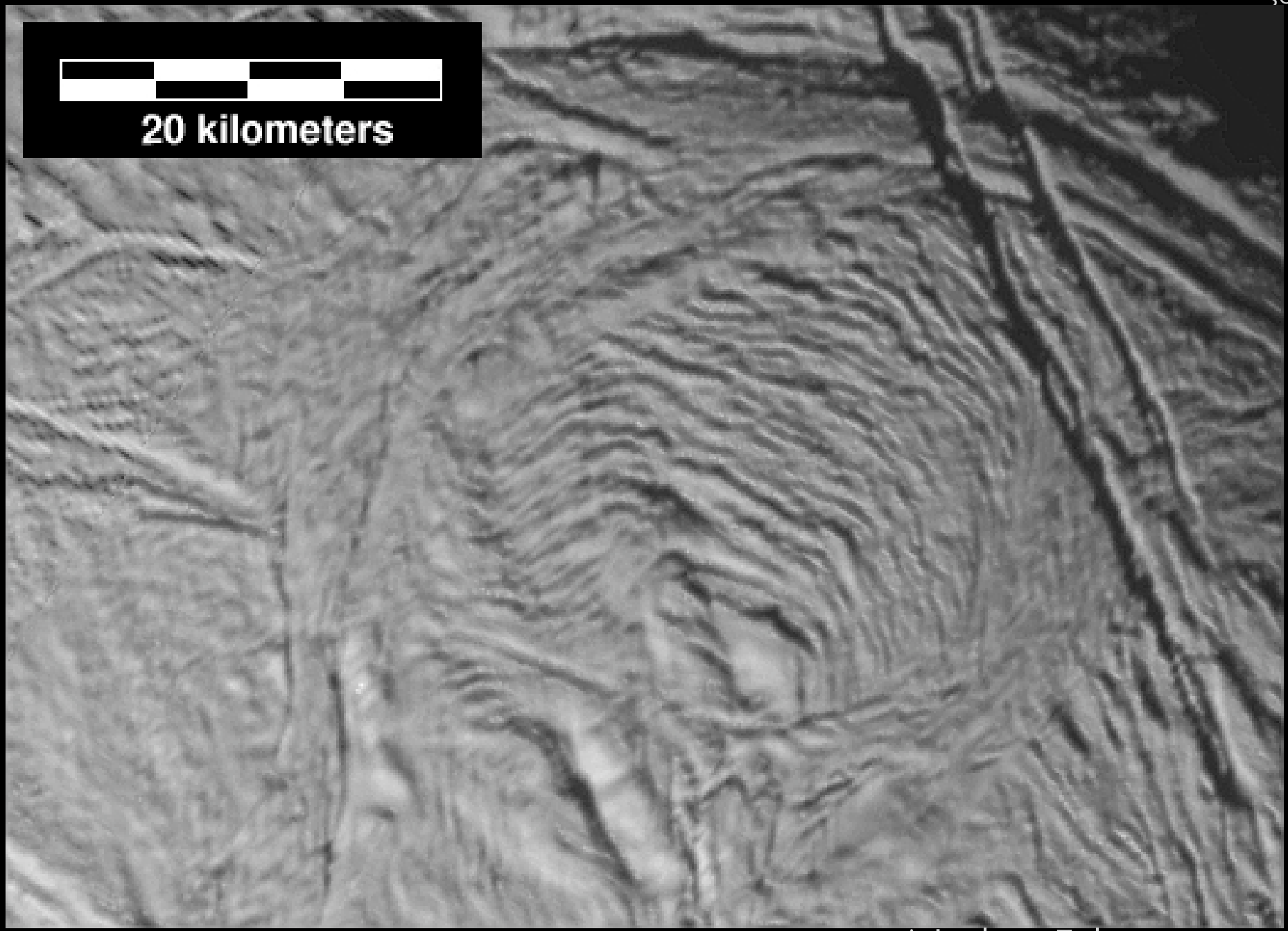
CHARM telecon, 26 April 2005

100 m/pixel; 17 February 2005

Sheared Surface

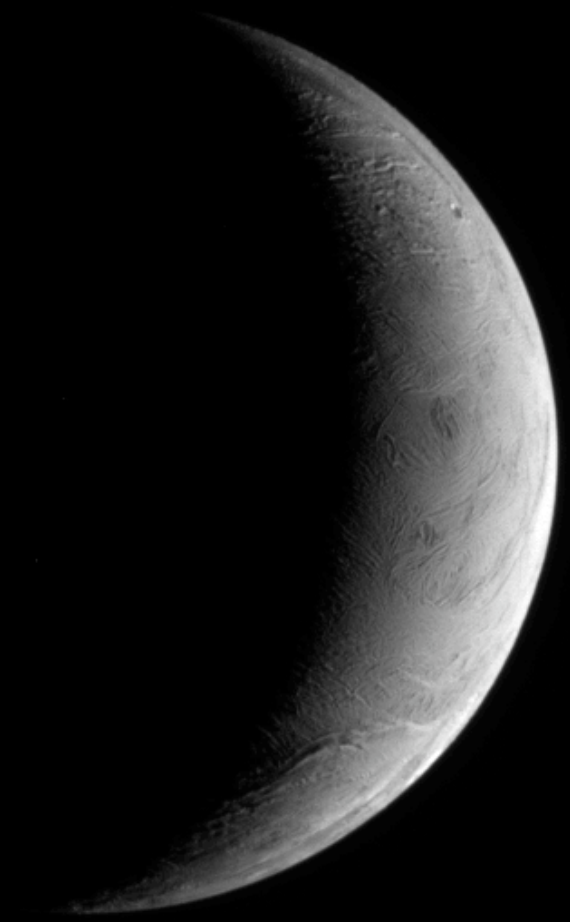


60 m/pixel; 17 February 2005



170 m/pixel; 17 February 2005

- Older cratered terrain
  - modified by viscous relaxation
  - overprinted by fracturing
  - small craters appear smoothed
- Ubiquitous fractures
  - multiple sets and orientations
  - sharp-edged, relatively fresh
  - exposed color differences
- Ridges and domes ~1-km high
- Sheared surface features
- Significant geologic activity in past
  - no evidence to date for current activity



990 m/pixel; 9 March 2005